

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Expanding the Economic and Innovation)	GN Docket No. 12-268
Opportunities of Spectrum Through)	
Incentive Auctions)	

COMMENTS OF SPRINT NEXTEL CORPORATION

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I. INTRODUCTION AND SUMMARY

Sprint Nextel Corporation (“Sprint”) respectfully submits these Comments in response to the Wireless Telecommunications Bureau’s Public Notice seeking to supplement the record on the 600 MHz band plan (“Public Notice”).¹ Sprint has been a strong supporter for using a time-division duplex (TDD) band plan at 600 MHz, and we continue to believe that TDD offers the best approach for meeting the FCC’s five key policy goals: utility, certainty, interchangeability, quantity and interoperability. With respect to addressing potential market variation (i.e., differing amounts of spectrum cleared in different markets), the focus of this Public Notice, a TDD band plan provides the simplest, most flexible and most commercially valuable approach

¹ Public Notice, *Wireless Telecommunications Bureau Seeks to Supplement the Record on the 600 MHz Band Plan*, GN Docket No. 12-268 (May 17, 2013) (“Public Notice”).

for accommodating different market scenarios. No frequency-division duplexing (FDD) approach can provide comparable flexibility while still ensuring that there is maximum opportunity for competitive entry in this highly important spectrum.

Sprint appreciates the Bureau's efforts to formulate a fuller record on the best band plan for the Commission to adopt. While some in industry assert that an industry consensus has been reached on a 600 MHz band plan,² both the comments in the proceeding and the testimony in the LEARN workshop indicate that large differences of opinion still exist.³ Under these circumstances, the Bureau's acted wisely in seeking additional information and comment on alternative band plan designs. Given the extraordinary impact the band plan will have on

² AT&T Public Policy Blog, "Working Toward an Effective Band Plan" (May 21, 2013), *available at* <http://attpublicpolicy.com/uncategorized/working-toward-an-effective-band-plan/> (criticizing the release of the Public Notice in light of "industry consensus" on the 600 MHz band).

³ Serious disagreement exists on, among other significant aspects of the band plan, the situation of TV stations within the duplex gap, duplex gap size, appropriate technology for the band (TDD, FDD, or a combination), and size of the passband for FDD band plans. *See, e.g.*, Reply Comments of DISH Network Corp., GN Docket No. 12-268, at 4 (filed March 12, 2013) (supporting location of TV channels within the duplex gap); Doug Hyslop, Competitive Carriers Association, *LEARN: 600 MHz Band Plan Workshop*, GN Docket No. 12-268, at 42-43 (May 3, 2013) (arguing that no genuine interference concerns exist from locating TV channels within duplex gap); *But see* Reply Comments of National Association of Broadcasters, GN Docket No. 12-268, at 3 (filed March 12, 2013) (arguing that "interspersing broadcasters between wireless uplink and downlink operations...does not work."); Reply Comments of Alcatel-Lucent, GN Docket No. 12-268, at 2 (filed March 12, 2013) (citing "technical concerns" with TV channels located within the duplex gap and describing) ("Alcatel-Lucent Reply Comments"); Reply Comments of AT&T, Inc., GN Docket No. 12-268, at 13 (filed March 12, 2013) (opposing placement of television stations within duplex gap "because doing so would create a significant risk of intermodulation interference") ("AT&T Reply Comments"); Comments of Google Inc. and Microsoft Corp, GN Docket No. 12-268, at 37 (filed Jan. 25, 2013) (arguing that a technically reasonable duplex gap size is 28 MHz); Comments of Comcast Corp. and NBCUniversal Media, LLC, GN Docket No. 12-268, at 45 (filed Jan. 25, 2013) (claiming that a duplex gap of "at least" 20 MHz is necessary); *But see* Alcatel-Lucent Reply Comments, at 3 (disputing claims by Google and Microsoft and arguing that a duplex gap "should be 10 or 12 MHz wide, and need not be any wider"); Reply Comments of Verizon and Verizon Wireless, GN Docket No. 12-268, at 3 (filed March 12, 2013) (asserting that a duplex gap of 10 or 11 MHz is appropriate) ("Verizon Reply Comments"); Reply Comments of Sprint Nextel Corp., GN Docket No. 12-268, at 15 (filed March 12, 2013) (supporting a TDD allocation) ("Sprint Reply Comments"); Comments of Clearwire Corp., GN Docket No. 12-268, at 11 (filed Jan. 25, 2013) (advocating a TDD allocation or alternatively a hybrid band plan featuring TDD and FDD); *See also* Reply Comments of Cellular South, Inc. (d/b/a C Spire Wireless), GN Docket No. 12-268, at 7 (filed March 12, 2013) (calling for further evaluation by the Commission on whether to adoption TDD over FDD); *But see* AT&T Reply Comments, at 15 (claiming that only two commenters support TDD and arguing that FDD represents the only viable option); Reply Comments of T-Mobile USA, Inc., GN Docket No. 12-268, at 14-15 (filed March 12, 2013) (arguing that a 35x35 MHz band plan is optimal and technically achievable) ("T-Mobile Reply Comments"); *But see* Reply Comments of Qualcomm Inc., GN Docket No. 12-268, at 24 (filed March 12, 2013) (expressing serious concerns over the feasibility of a 35x35 MHz FDD plan given antenna and duplex design constraints) ("Qualcomm Reply Comments").

repacking, adjacent channel operations, the amount of mobile broadband spectrum made available, and the competitive landscape, the public interest is best served by the Bureau's diligence in identifying the optimum approach to promote downstream, long-term wireless broadband competition, thereby stimulating innovation and creating jobs, while successfully providing sufficient revenue to realize the requirements of the Spectrum Act and fund construction of the Nationwide Public Safety Broadband Network ("NPSBN").

II. THE 600 MHz INCENTIVE AUCTION PRESENTS THE BEST OPPORTUNITY FOR NEW SPECTRUM BEING MADE AVAILABLE FOR COVERAGE AND COMPETITION; GETTING THE BAND PLAN CORRECT IS CRITICALLY IMPORTANT

As the last remaining spectrum below 1 GHz available for mobile broadband use for the foreseeable future, the 600 MHz band will have a significant impact on the shape and trajectory of competition within the wireless industry for many years to come. While operators undeniably require additional licensed spectrum to continue to provide robust broadband services, the public interest requires that the Commission establish a balanced regulatory framework – including the most efficient and pro-competitive band plan for the Incentive Auction.

The Commission explicitly recognized the distinct advantages of 600 MHz spectrum in its NPRM.⁴ Like other spectrum below 1 GHz, 600 MHz spectrum will offer operators the ability to achieve wide-area coverage and superior in-building penetration. As the Commission has consistently noted, holding a mixture of higher and lower frequency spectrum is optimal for

⁴ *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, GN Docket No. 12-268, at ¶ 394 (rel. Oct. 2, 2012) (*Incentive Auctions NPRM*) (noting that the "propagation characteristics of the 600 MHz band should allow for robust coverage at a lower cost than some other comparable bands" and cross-referencing the conclusions of the Fifteenth Mobile Wireless Competition Report (paragraphs 292-297) on the distinct advantages of "lower frequency bands").

an operator seeking to provide robust service at a competitive cost.⁵

Unfortunately, the ability of most providers to achieve such a mix has been hampered by the extensive concentration of spectrum below 1 GHz, with 75% of such spectrum held by AT&T and Verizon – including over 80% in the Top 50 U.S. markets. In this environment, other operators cannot achieve the long-term operating economics these two operators enjoy without also having access to the low-band spectrum essential to providing the extensive coverage and in-building service customers demand. In order for other operators to effectively compete with these dominant providers – and to produce the innovation, competition and investment the Commission has associated with the 600 MHz band – the Commission should adopt auction rules and a band plan that provide the greatest amount of licensed spectrum *to the greatest number of operators*. A band plan or auction rules that allows the continued concentration of scarce, competitively-critical low-band spectrum subverts the public interest, diminishes the prospect of sustainable future wireless competition, and constrains the innovation and investment otherwise unleashed in a competitive wireless market.

III. TDD OFFERS THE GREATEST OPPORTUNITY TO MEET THE COMMISSION’S STATED POLICY GOALS, MAXIMIZE THE OPPORTUNITY FOR COMPETITION, AND ACCOMMODATE MARKET VARIATION

Sprint remains convinced that a TDD band plan presents the most attractive method for the Commission to hold a successful auction and promote sustainable robust wireless broadband competition. As Sprint emphasized in its original filings, the optimal band plan for achieving the Commission’s policy goals must: 1) maximize the amount of spectrum that can be auctioned for

⁵ Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Fifteenth Report*, 26 FCC Rcd 9664, 9682 (2011) (*Fifteenth Report*); Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Mobile Services, WT Docket No. 11-186, *Sixteenth Report*, at ¶ 135 (2013) (*Sixteenth Report*).

commercial use by multiple competitors; 2) stimulate sufficient auction revenues to support the important policy goals of the Spectrum Act; 3) provide reasonable protection from interference to services that will continue to operate in neighboring spectrum; 4) promote scale and interoperability, while avoiding the creation of band segments that are disadvantaged because of neighboring uses; 5) minimize the amount of spectrum that must be put to restricted use (such as guard bands and duplex gaps); and 6) provide a scalable approach that, if necessary, can work to accommodate varying amounts of spectrum in different geographic locations if different amounts are cleared. A TDD band plan achieves all of these objectives; the FDD band plans contained in the record, including the FDD band plan proposed in the Public Notice, thus far do not.

A. A TDD Band Plan Provides the Greatest Amount of Licensed, Bi-Directional Spectrum for Use by Multiple Competitors, Generating More Revenue

As the Public Notice observes, one of the key policy goals the Commission articulated in its NPRM is to unleash the greatest amount of spectrum for mobile broadband possible without significantly undermining other core policy goals such as certainty and utility.⁶ Maximizing the amount of licensed spectrum available for mobile broadband achieves two key public policy objectives. At the most fundamental level, the more licensed spectrum available for wireless operators, the more revenue the auction will generate.⁷ Beyond auction revenues, however, the quantity of spectrum auctioned can have a significant and pro-competitive effect on the wireless industry.

⁶ *Id.* at 2.

⁷ Contrary to assertions by AT&T and T-Mobile, there is no reason to believe that, on a MHz/POP basis, TDD will generate less revenue than an FDD band plan. AT&T Reply Comments, at 15; T-Mobile Reply Comments, at 6. As the only new low-band spectrum up for auction, demand will likely be uninfluenced by technology. Moreover, by auctioning more bi-directional spectrum than a comparable FDD alternative – and with significantly greater spectral efficiency – a TDD band plan could generate more revenue than an FDD band plan.

This latter public policy goal, however, can only be realized if auctioning more spectrum provides meaningful opportunities for *multiple operators to acquire it and use it to expand their coverage and capacity*. A band plan that facilitates a simple split of competitively-significant low-band spectrum between two dominant incumbents (which together already hold over 80% of such spectrum in the Top 50 U.S. markets) actually subverts competition in the wireless marketplace. Specifically, the band plans offered by AT&T and Verizon conveniently feature 25 MHz and 20 MHz blocks for paired spectrum, respectively – as a practical matter likely allowing two operators at most to acquire paired 2x10 MHz blocks.⁸ As Sprint explained in its Reply Comments, “These band plans lend themselves to equitable partitioning between two operators, resulting in the potential scenario of AT&T and Verizon winning the lion’s share of 600 MHz spectrum, with limited (if any) meaningful 600 MHz entry by other carriers...”⁹

Similarly, a band plan that provides only limited uplink spectrum – as is likely to occur with FDD band plans in markets where little television spectrum is available – unnecessarily limits the opportunity for competitive use of the band. The FDD band plan contained in the Public Notice clearly documents the problem.¹⁰

⁸ Comments of AT&T, Inc., GN Docket No. 12-268, at 32 (filed Jan. 25, 2013) (“AT&T Comments”); Comments of Verizon and Verizon Wireless, GN Docket No. 12-268, at 11 (filed Jan. 25, 2013) (“Verizon Comments”).

⁹ Sprint Reply Comments, at 9.

¹⁰ The Commission’s initial NPRM FDD band plan has similar problems. *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, Notice of Proposed Rulemaking, GN Docket No. 12-268, at ¶ 139 (rel. Oct. 2, 2012) (*Incentive Auctions NPRM*).

Market Variation in Down from 51 Reversed, *less* than 84 MHz cleared

Standard market plan

LMR	TV Channels	37	T V	GB	Uplink	DG	Down- link	GB	700 MHz Uplink
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Constrained market option A		37		GB	UL	DG	DL	GB	
Constrained market option B		37	37		GB	UL	DG	DL	GB
Constrained market option C		37			GB	UL	DG	DL	GB

Market Variation in Down from 51 Reversed, *more* than 84 MHz cleared

Standard market plan

LMR	TV Channels	GB	Uplink	37	Uplink	DG	Downlink	GB	700 MHz Uplink
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Constrained market option A		GB	UL	37	UL	DG	DL	GB	
Constrained market option B			GB	UL	37	UL	DG	DL	GB
Constrained market option C				UL	37	UL	DG	DL	GB
Constrained market option D				UL	37	GB	UL	DG	DL
Constrained market option E				UL	37	GB	UL	DG	DL

In order to accommodate market variability, the Commission and other FDD supporters propose to limit the amount of uplink spectrum that would be made available for auction and use in the market. Such an approach would unnecessarily sacrifice the utility – and thus desirability and availability of this spectrum – for operators that do not already have low-band spectrum, since those potential competitors need uplink spectrum with similar propagation characteristics to take advantage of the downlink spectrum. Furthermore, it would create a significant number of unpaired downlink spectrum blocks that would be of very limited use to anyone except AT&T and Verizon – the two operators that already hold licenses for ample paired low-band spectrum that could be paired with ‘excess’ unpaired 600 MHz spectrum.¹¹ This approach would limit the

¹¹ AT&T Comments, at 32 (devoting 20 and 35 MHz to supplemental downlink under different clearing scenarios); Verizon Comments, at 12 (dedicating all spectrum to supplemental downlink in markets where more than 72 MHz clears); Qualcomm Reply Comments, at 7 (calling for allocation of all spectrum blocks for supplemental downlink if more than 72 MHz is cleared).

opportunity for competitive access to the 600 MHz spectrum, and coincidentally provide additional downlink spectrum that is likely to only further skew the imbalanced competitive situation.

Auctioning unpaired FDD downlink blocks in some markets in order to accommodate market variability is also likely to significantly reduce the revenues that would be raised in the incentive auction, since the potential pool of bidders would be limited. As both Sprint and other commenters have argued, in maximizing the amount of spectrum available, the Commission should focus on spectrum that has both uplink and downlink capabilities.¹² Rather than promoting competitive entry opportunities, however, supplemental downlink spectrum can thwart interoperability, deter entry, and reduce auction revenue.¹³

Most notably, without a low-band ‘return link’ from spectrum with similar propagation characteristics – that is, spectrum owned by operators with paired 600 or 700 MHz licenses – supplemental downlink traffic offers no real value to potential bidders. Some parties have

¹² Comments of T-Mobile USA Inc., GN Docket No. 12-268, at 5-6 (filed Jan. 25, 2013) (“Absent a paired allocation, new and expanding entrants would need to spend considerable resources acquiring the downlink portion without any assurance that they could acquire the return-link spectrum in other bands.”); Comments of MetroPCS Communications, Inc., GN Docket No. 12-268, at 21 (filed Jan. 25, 2013) (“As a new entrant, having both uplink and downlink spectrum is an obvious necessity, and auctioning spectrum in unpaired blocks risks discouraging new entrants from bidding in the auction, lest they become stranded with a lone block of uplink or downlink spectrum.”).

¹³ Darryl DeGruy, Strategic Planning Lead Engineer, U.S. Cellular Corp., *LEARN: 600 MHz Band Plan Workshop*, GN Docket No. 12-268, at 230-231 (May 3, 2013) (“If [supplemental downlink] is paired with other spectrum above a gigahertz, there are different fragmentations of who owns that spectrum above 1 GHz. So there becomes an interoperability concern over what pairing does that supplemental downlink get ultimately tied to in the high band? If you are a carrier that doesn’t align with that spectrum or doesn’t have an overlay of the supplemental downlink, that is going to devalue it, because I probably will not bid on a supplemental downlink...[if] I don’t have high frequency carriers to aggregate that with.”); Reply Comments of DISH Network Corp., GN Docket No. 12-268, at 6 (filed March 12, 2013) (“DISH Reply Comments”) (“Conversely, the alternate plans’ emphasis on supplemental downlink would be most useful to the largest incumbents, which already enjoy healthy spectrum positions in the cellular 800 MHz and 700 MHz bands. Allocation of supplemental downlink spectrum in the 600 MHz band would thus remove opportunities for new entrants and regional and local operators to economically expand their service areas.”); Harold Feld, Senior V.P., Public Knowledge, *LEARN: 600 MHz Band Plan Workshop*, GN Docket No. 12-268, at 233 (May 3, 2013) (“If you [utilize supplemental downlink] you also have the real problem of creating essentially two auctions. The auction for the actual good licenses and then the consolation auction for the supplemental downlinks.”)

suggested that supplemental downlink spectrum could be used through carrier aggregation with spectrum from another band. However, such an approach would squander the propagation advantages that are inherent to low-band spectrum, since the supplemental downlink spectrum would only be usable to the distance that the higher frequency carrier-aggregated band could propagate.

Moreover, the carrier aggregation opportunities for 600 MHz supplemental downlink are likely confined to specific bands such as cellular, PCS, or AWS.¹⁴ As U.S. Cellular notes, the standards work for such aggregation will likely be driven by the dominant operators, potentially eliminating carrier aggregation opportunities for operators without spectrum in those bands.¹⁵ With a restricted amount of paired spectrum offered by FDD band plans (making FDD band plans particularly susceptible to aggregation by the two dominant operators absent stringent spectrum aggregation rules) and high concentration in the 700 MHz band,¹⁶ supplemental downlink offers meaningful value only to the two large operators. An operator bidding on supplemental downlink must own (or hope to acquire) paired 600 MHz or 700 MHz spectrum for the ‘return link’ or own licenses in the targeted bands such as cellular and AWS that the supplemental downlink can be carrier aggregated with.

¹⁴ Reply Comments of Ericsson Inc., GN Docket No. 12-268, at 15 (filed March 12, 2013) (“Ericsson Reply Comments”).

¹⁵ Given the exceptional concentration in the cellular band – in which two operators control 92% of the spectrum – and AWS band – in which two operators control over 70% (and Verizon, T-Mobile and AT&T control over 76%) – it seems highly likely that carrier aggregation standards work will operate to the detriment of smaller operators, or operators like Sprint that don’t possess AWS spectrum. *See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Wireless Services*, WT Docket No. 11-186, *Sixteenth Report*, at ¶ 118 (rel. March 21, 2013) (“Sixteenth Report”).

¹⁶ AT&T and Verizon control 78% of the 700 MHz spectrum, with much of the remaining spectrum’s utility hampered by a lack of interoperability in the lower 700 MHz band. *See Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, including Commercial Wireless Services*, WT Docket No. 11-186, *Sixteenth Report*, at ¶ 118 (rel. March 21, 2013) (“Sixteenth Report”).

By contrast, in removing the legacy artifice of a duplex gap, a TDD band plan provides a flexible framework with which to maximize the amount of spectrum for commercial broadband. Unlike an FDD band plan anchored to a duplex gap, a TDD band plan can be expanded seamlessly, flexibly accommodating the maximum amount of spectrum repurposed and offering it for bi-directional use. Furthermore, a new low-band licensee needs no other spectrum in order to offer service, and the propagation benefits of the low-band spectrum can be fully achieved, promoting greater competition and more robust service for American consumers. Whereas an FDD band plan could result in “an inordinate amount of downlink-only spectrum blocks being made available at auction,” commenters have recognized the ability of TDD to “preserve downlink and uplink flexibility.”¹⁷ And in contrast to the significant band alignment problems associated with supplemental downlink described above, TDD can help “avoid fragmentation and promote interoperability.”¹⁸

Aside from the tremendous advantages of a TDD band plan in providing more bi-directional spectrum than an FDD alternative, a TDD band plan also provides operators with the ability to better address the asymmetrical traffic demands they currently face. Indeed, these traffic demands – with considerably more downlink traffic than uplink traffic – serve as the underlying motivation for problematic supplemental downlink schemes. Even assuming the Commission adopted an ambitious FDD plan such as that proposed by T-Mobile (featuring a dual-duplexer, 2x35 MHz allocation), TDD would provide a significantly more spectrally efficient use of the bi-directional spectrum, with more traffic in the downlink direction per megahertz than FDD.

¹⁷ Alcatel-Lucent Comments, at 11-12.

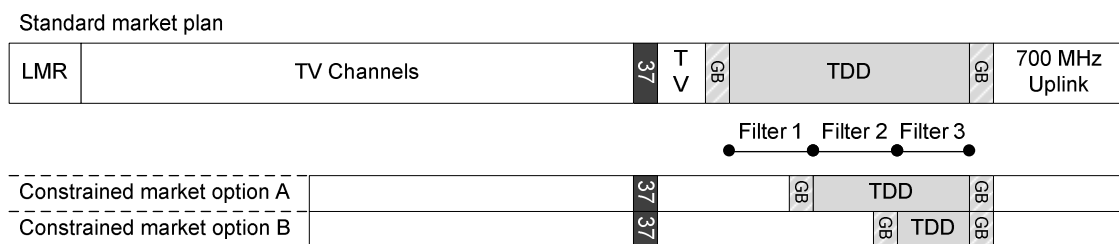
¹⁸ Ericsson Reply Comments, at 15.

B. A TDD Band Plan Offers the Commission the Greatest Flexibility to Accommodate Market Variation

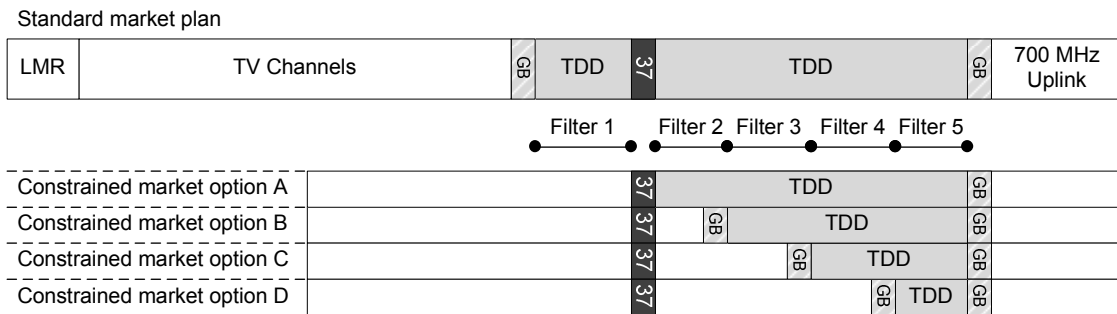
While commenters are largely in agreement that the Commission should limit the amount of variation between markets, the Commission rightly seeks a band plan framework that can offer a degree of flexibility to accommodate market variation. In the alternative, the 600 MHz band would exhibit a ‘race to the bottom,’ repurposing nationwide the amount that the most spectrum-constrained markets would yield. Such a result would represent a profound misfortune, failing to realize the goals of Congress – unleashing the greatest amount of mobile broadband spectrum to promote innovation, investment, and competition – and the true potential of the 600 MHz band.

The ease of allocating additional repurposed spectrum for mobile broadband in a TDD band plan represents one of its chief advantages over an FDD-based approach. The TDD band plan proposed in the Public Notice provides a good example of how this can work:

Market Variation in Down from 51 TDD, *less* than 84 MHz cleared



Market Variation in Down from 51 TDD, *more than 84 MHz cleared*



All TDD spectrum inherently provides both uplink and downlink capability, so each megahertz of spectrum that would be auctioned is of equal value, and is useful to both new competitors that need low-band spectrum as well as those that already have low-band spectrum. The TDD band plan also uniquely enables simple matching of spectrum to the amount cleared through the incentive auction process, without worry of the need for a duplex gap (and its specific location) or for balancing uplink and downlink spectrum amounts.¹⁹ Finally, TDD has been used in many similar situations to deal with band conditions that don't lend themselves to pairing, such as in the 2.5 GHz band. As Sprint noted in its original comments, TDD has been referred to as the "global solution for unpaired spectrum," increasingly adopted in scenarios where, when spectrum is scarce, artificially bifurcating a band into dedicated uplink and downlink channels, with intervening duplex gaps, makes little spectrum policy sense.²⁰ Analogously, TDD has been used for years in Wi-Fi networks, where detailed and rigorous spectrum planning is not possible due to the wide variety of uses in the band.

¹⁹ Despite its opposition to a TDD band plan, T-Mobile acknowledges this advantage of TDD, noting that "it would be easier to incorporate TDD rather than FDD in some 600 MHz clearing scenarios because the variable amounts of spectrum that the 600 MHz reverse auction will clear will not always neatly support both ends of a paired configuration." T-Mobile Reply Comments, at 37.

²⁰ Sprint Comments, at 18.

The Commission's TDD band plan assumes the use of multiple TDD filters that could be switched in and out to accommodate market variation. However, advancements in filter design are likely to enable the use instead of tunable filters and antennas, which will further simplify device design and dynamically adjust to the spectrum that a licensee is using in each market.

C. TDD Poses No Undue Interference Risks

Contrary to the assertions of some FDD band plan proponents, a TDD band plan such as that proposed by Sprint or that contained in the Public Notice presents no significant interference risks to adjacent services. As contemplated by Sprint and in the context of the Public Notice, a TDD band plan at 600 MHz would utilize a modest guard band to separate TDD operations from lower 700 MHz uplink channels and, depending on the amount cleared, a modest guard band at the bottom of the band separating TDD operations from any remaining television stations.²¹

To be sure, operators in the 600 MHz band would be required to adopt a common asymmetry ratio to prevent interference between TDD blocks. As Sprint noted in its Reply Comments, however, this common industry practice is neither difficult, nor unusual. In the 2.5 GHz band, for instance, four operators adopted a common synchronization plan in 2008 after only a few months of consultations, committing to GPS-locked synchronization and shared signaling periods. Operators agreed to revisit that asymmetry ratio as needed. That original asymmetry ratio and synchronization agreement remains in effect today.

Operators currently report quite similar traffic patterns – indeed, the concept of supplemental downlink stems from a common need for more spectrum to satisfy downlink traffic. With the adoption of guard bands as the only feasible alternative, and with similar traffic

²¹ Sprint Comments, at 22; Public Notice at 6.

patterns, it is entirely reasonable to expect operators to agree on uplink/downlink ratios. Moreover, as noted by Ericsson, indoor deployments could conceivably feature adjusted ratios without requiring extensive coordination²² – a significant advantage for a TDD band plan in the context of major events such as the 2012 Super Bowl, where traffic patterns inside the stadium shifted dramatically towards uplink.²³

Claims of unwanted harmonic effects should not deter the Commission’s adoption of a TDD band plan. As Sprint argued in its Reply Comments, while there is “truth to the mathematical possibility of unwanted interference from third, fourth, and even fifth order harmonics, virtually any frequency in use today, divided by 2, 3, 4, or 5, corresponds to a core wireless frequency currently used by a wireless service.”²⁴ These potential harmonic scenarios have not hampered deployment in other bands – for instance, second order harmonics of 700 MHz that fall into GPS and third order harmonics from the Lower 700 MHz D Block (716-722 MHz) that formerly fell into Sprint Nextel’s Multipoint Distribution Service channel MDS-1 (2150-2156 MHz). Through standard Commission rulemaking (including reasonable out-of-band emissions limits) and modest industry resolve, such harmonic effects can easily be solved – particularly in the case of crucial low-band spectrum, which readily invites practical, technical solutions.

²² Ericsson Reply Comments, at 23.

²³ See Comments of Nokia Siemens Networks US LLC, GN Docket No. 12-268, at 5 (filed Jan. 25, 2013) (“Nokia Siemens Networks Comments”); Robert Cheng, “Super Bowl drives supersized wireless traffic,” CNET, February 7, 2012, available at http://news.cnet.com/8301-1035_3-57372694-94/super-bowl-drives-supersized-wireless-traffic/.

²⁴ Sprint Reply Comments, at 17-18.

D. TDD and Global Harmonization

Contrary to the assertions of some commenters,²⁵ TDD is widely used in the United States and throughout the world, and many new deployments incorporate the inherent advantages of TDD. Indeed, significantly more bidirectional traffic is transmitted worldwide via TDD than via paired spectrum allocations and, contrary to the assertions of AT&T, every operator in the United States utilizes TDD technology in the form of Wi-Fi. Moreover, major 4G standards, such as LTE and WiMAX, also include TDD implementations. Thus, FDD is by no means the industry standard for next generation networks; next generation network technologies such as LTE have firm TDD commitments from all the important equipment manufacturers.²⁶

This trend towards TDD is by no means surprising. Regulators and operators initially adopted paired spectrum approaches decades ago, when FDD was the simplest approach for meeting the needs of circuit-switched voice services where customers expected to be able to talk and listen at the same time. Today, however, broadband providers worldwide are focused on deploying data services using communications protocols that don't necessarily transmit and receive at the same time, and don't require separate uplink and downlink transmission paths. As a result, many experts have suggested that TDD is a preferred approach when regulators are

²⁵ T-Mobile Reply Comments, at 36 (erroneously asserting that "FDD represents the industry standard for next generation network"); AT&T Reply Comments, at 2 (referring to TDD as "an outlier technology in the United States").

²⁶ Nokia Siemens Networks Comments, at 11; Alcatel-Lucent Comments, at 3; Motorola, "TD-LTE: Exciting Alternative, Global Momentum," White Paper (2010), *available at* http://www.motorola.com/web/Business/Solutions/Industry%20Solutions/Service%20Providers/Network%20Operators/_Documents/_static%20files/TD-LTE%20White%20Paper%20-%20FINAL.pdf ("Motorola White Paper"); Sumit Verman, Qualcomm Inc., *LEARN: 600 MHz Band Plan Workshop*, GN Docket No. 12-268, at 211 (May 3, 2013) ("we build chipsets that support FDD and TDD technology"); Ericsson, Ericsson demonstrates TD-LTE interoperability on global platforms," Press Release (Nov. 5, 2009) *available at* http://www.ericsson.com/news/091105_td-lte_254740099_c ("As LTE enables the same multi-standard radio base station and user equipment platforms to be used for both FDD and TDD deployments, it opens up a truly global ecosystem for the technology. Operators using either duplex mode will be able to enjoy the overall economies of scale of LTE, and Ericsson will offer operators optimized global solutions whichever duplex mode they require.")

establishing new wireless bands that aren't extensions of existing bands.²⁷ And many broadband operators have deployed TDD solutions around the world.²⁸

Indeed, in similar scenarios outside the U.S., spectrum policymakers most likely will select TDD to accommodate the future likelihood of additional broadcasters going off air or relocating to lower frequencies. The flexibility offered by TDD makes it not only attractive in unpaired spectrum bands, but ideal for spectrum bands that might expand to accommodate additional mobile broadband channels. By contrast, supplemental downlink is a niche technology that has not gained significant support globally – and, as U.S. Cellular has noted, will be driven by *individual operators'* needs (since different operators hold different spectrum in different bands).²⁹ Rather than representing an outlier policy choice by the FCC, designating the 600 MHz band for TDD enables the United States to play an active role in a technology trend otherwise led by other nations.

IV. CONCLUSION

Sprint applauds the Bureau's effort to develop a more informed and focused record from which the Commission can formulate a band plan that best promotes a successful auction and a more competitive wireless broadband industry. Significant disagreement currently exists as to

²⁷ See, e.g., Hossein Eslambolchi, PhD, *LTE TDD versus FDD Debate*, 2020 Venture Partners Blog (Dec. 28, 2011), available at <http://www.2020vp.com/hossein-blog/2011/12/lte-tdd-versus-fdd-debate/> (discussing how LTE-FDD adoption is a function of legacy regulatory and deployment choices rooted in voice services; greenfield networks and allocations, by contrast, “will naturally gravitate to TDD-LTE.”).

²⁸ Operators already deploying TDD technology include: AERO2 (Poland), Bharti Airtel (India), Clearwire (United States) Hi3G (Denmark and Sweden), Mobily (Saudi Arabia), NBN (Australia), SoftBank (Japan), Sky TV (Brazil), and STC (Saudi Arabia). More than twenty-six operators, in Africa, Australia, North America, South America, Asia and Europe, have clear TD-LTE commercial deployment plans. See GTI Secretariat (ed.), *TD-LTE Industry Briefing*, Global TD-LTE Initiative (Aug. 1, 2012), available at <http://www.lte-tdd.org/sites/default/files/TDLTE%20Industry%20Briefing%20-%20August%202012.pdf>

²⁹ See note 13 *supra*.

the best way to structure the 600 MHz band, necessitating a more sharpened inquiry. As the plan offering the Commission the greatest flexibility to accommodate market variation, and generating the greatest amount (and most spectrally efficient) spectrum for mobile broadband, a TDD band plan merits serious Commission consideration.

Respectfully submitted,

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